

Intel's Enterprise Processor Roadmap

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Enterprise Technology Requirements

Efficient Compute Power

*Inside the Enterprise
Inside the Server
Inside the Processor*

Scalability

Reliability,
Availability, and
Serviceability
(RAS)



Enterprise Innovation for All Segments

Intel Performance Leadership

	tpmC	\$/tpmC
Best Performance ¹	709,220	\$14.96
Best 4P Performance ²	39,158	\$8.77
Best Price/Performance ³	9,347	\$4.83

 Even better performance in 2002 due to:

- Intel® Xeon™ Processor
- NetBurst™ micro-architecture
- McKinley Processor
- EPIC micro-architecture
- Hyper-Threading Technology
- Frequency Scaling
- Faster Front Side Bus
- Cache Enhancements



1. Source: TPC.ORG, 9/01. Clustered configurations of 8-Processor Systems. Each node configured as follows: Compaq® ProLiant DL760, 8 Pentium III Xeon 900MHz, 2MB L2 Cache, 8GB mem, Integrated Smart Array Controller, Integrated Smart Array Controller, Microsoft SQL Server 2000 Enterprise Edition, Microsoft Windows 2000 Advanced Server, Microsoft COM+.

2. Source: TPC.ORG, 9/01. Configurations of 4-Processor System configured as follows: Compaq® ProLiant DL580 6/900, 4 Pentium III Xeon 900MHz, 2MB L2 Cache, Microsoft SQL Server 2000 Enterprise Edition, Microsoft Windows 2000 Advanced Server, Microsoft COM+.

3. Source: TPC.ORG, 9/01. Configurations of 1-Processor System configured as follows: Compaq® ProLiant ML530-x1000-1P, 1 Pentium III Xeon 1GHz, Microsoft SQL Server 2000 Edition, Microsoft Windows 2000 Server.

Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, reference www.intel.com/procs/perf/limits.htm or call (U.S.) 1-800-628-8686 or 1-916-356-3104.

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Intel IA-32 Enterprise Processors – 2002 & Beyond

<u>System</u>	Q4'01	Q1'02	Q2'02	2H'02	2003
Back-End/ Mid-Tier Server (4P-8P+)	Intel® Pentium® III Xeon™ processor 2M iL2 .18μ	Intel® Xeon™ processor MP 1M iL3 .18μ		Gallatin .13μ	
Performance /Volume DP Server	Intel Pentium III processor 512K .13μ	Intel® Xeon™ processor (Prestonia) 512K .13μ			Nocona
Ultra Dense	Ultra Low Voltage Intel® Pentium® III processor 512K .13μ				Banias
High End WS					
Mid-Range WS	Intel® Xeon™ processor 256K .18μ	Intel® Xeon™ processor (Prestonia) 512K .13μ			Nocona

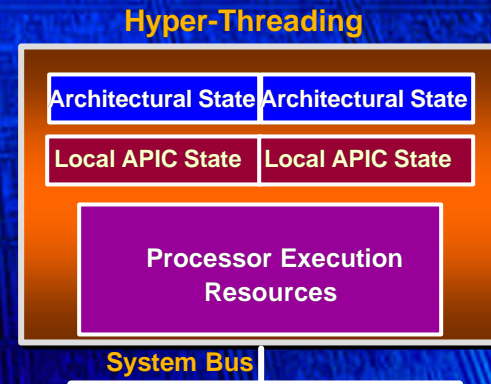


Increased Performance with NetBurst,
Bandwidth for Scalability, and RAS features

All products, dates, and figures are preliminary, for planning purposes only and are subject to change

Hyper-Threading Technology

- ✦ Small (<5%) increase in die size
- ✦ Up to 30% improvements in throughput
- ✦ Share execution resources between multiple threads
- ✦ Ideally suited for multi-tasking computing environments
- ✦ Exploits thread-level parallelism in software to increase use of on-chip execution resources
- ✦ Increases throughput when executing multi-threaded code
- ✦ Existing MP aware software is compatible with Hyper-Threading enabled platforms



Hyper-Threading Technology will appear on
Intel® Xeon™ Processor MP in 1H'02

Intel® Xeon™ MP Platform Benefits



	Intel® Pentium® III Xeon processor (MP)	Intel® Xeon™ processor MP
Micro-Architecture	P6 microarchitecture	Intel® NetBurst™ microarchitecture
Frequency	900 MHz	> 1.6 GHz
Front Side Bus	100MHz	400MHz
Front Side Bus Bandwidth	800 MB/s	3.2 GB/s
Memory	PC133	DDR200
Memory Capacity	16 GB	64 GB
I/O	PCI 64/33, 64/66	PCI-X 64/66, 64/100

Significant Enhancements to Enterprise Class Platforms



Intel Architecture Server Blades

Breadth of Intel Architecture



1P/2P
Blade



1P/2P
1U



2P
2U



4P
4U



8P
8U

Blades for High Density Environments

CPU Power Envelope	<10W (ultra low voltage), <15W (low voltage), ~30W (full voltage)
Processors	Ultra Low Voltage Intel® Pentium® III Processor
Chipset	Intel 440GX chipset (UP), Third Party chipsets (DP)
Features	ECC, DP capability, up to 4GB memory
Blade implementations	Custom, CompactPCI



Intel Enterprise Processors – Itanium® Processor Family

System	Q4'01	Q1'02	Q2'02	2H'02	2003
Back-End/ Mid-Tier Server (4P-8P+)	Intel® Itanium™ processor 4M L3 .18u		McKinley 3M .18u		Madison 6M .13u
	Intel® Pentium® III Xeon™ processor 2M iL2 .18u	Intel® Xeon™ 512K/ 1M iL3 .18u	processor MP Gallatin .13u		
Performance /Volume DP Server	Intel Pentium III processor 512K .13u		Intel® Xeon™ processor (Prestonia)		Deerfield 3M .13u
					Nocona
Ultra Dense	Intel® Pentium® III processor 512K .13u				Banias
High End WS	Intel® Itanium™ processor 4M L3 / .18		McKinley 3M/ .18u		Madison / Deerfield
Mid-Range WS	Intel® Xeon™ processor 256K .18u		Intel® Xeon™ processor (Prestonia)		Nocona



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McKinley Enhancements

Itanium™ Processor

System Bus

64 bits wide
266 MHz
2.1 GB/s

Width

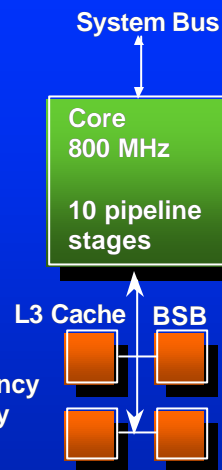
2 bundles per clock
4 integer units
2 load or stores per clock
9 issue ports

Caches

L1 – 2X16KB - 2 clock latency
L2 – 96K – 12 clock latency
L3 - 4MB external –20 clk
11.7 GB/s bandwidth

Addressing

44 bit physical addressing
50 bit virtual addressing
Maximum page size of 256MB



McKinley

System Bus

128 bits wide
400 MHz
6.4 GB/s

Width

2 bundles per clock
6 integer units
2 loads and 2 stores per clock
11 issue ports

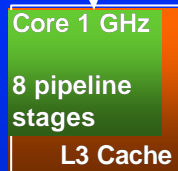
Caches

L1 – 2X16KB - 1 clock latency
L2 – 256K – 5 clock latency
L3 - 3MB – 12 clk
32 GB/s bandwidth

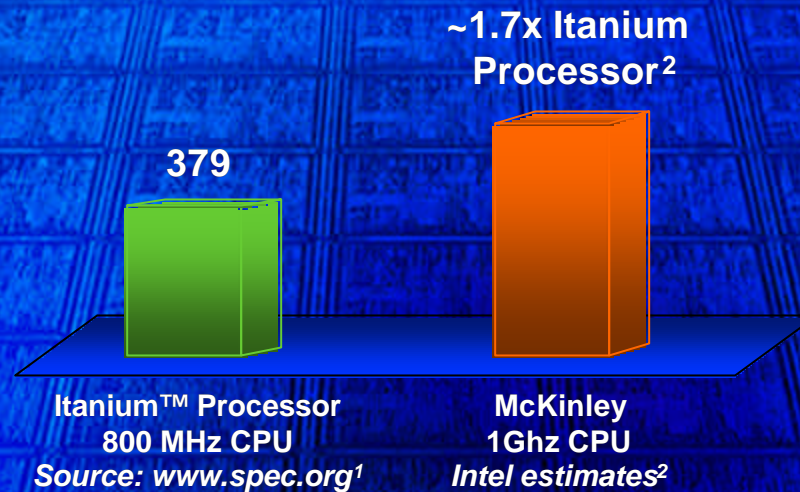
Addressing

50 bit physical addressing
64 bit virtual addressing
Maximum page size of 4GB

System Bus



Itanium™ Processor and McKinley Performance Projection on Itanium binaries SPECint2000 - base



**Robust Performance Scaling for Itanium Binaries;
Performance can be even higher with McKinley binaries**

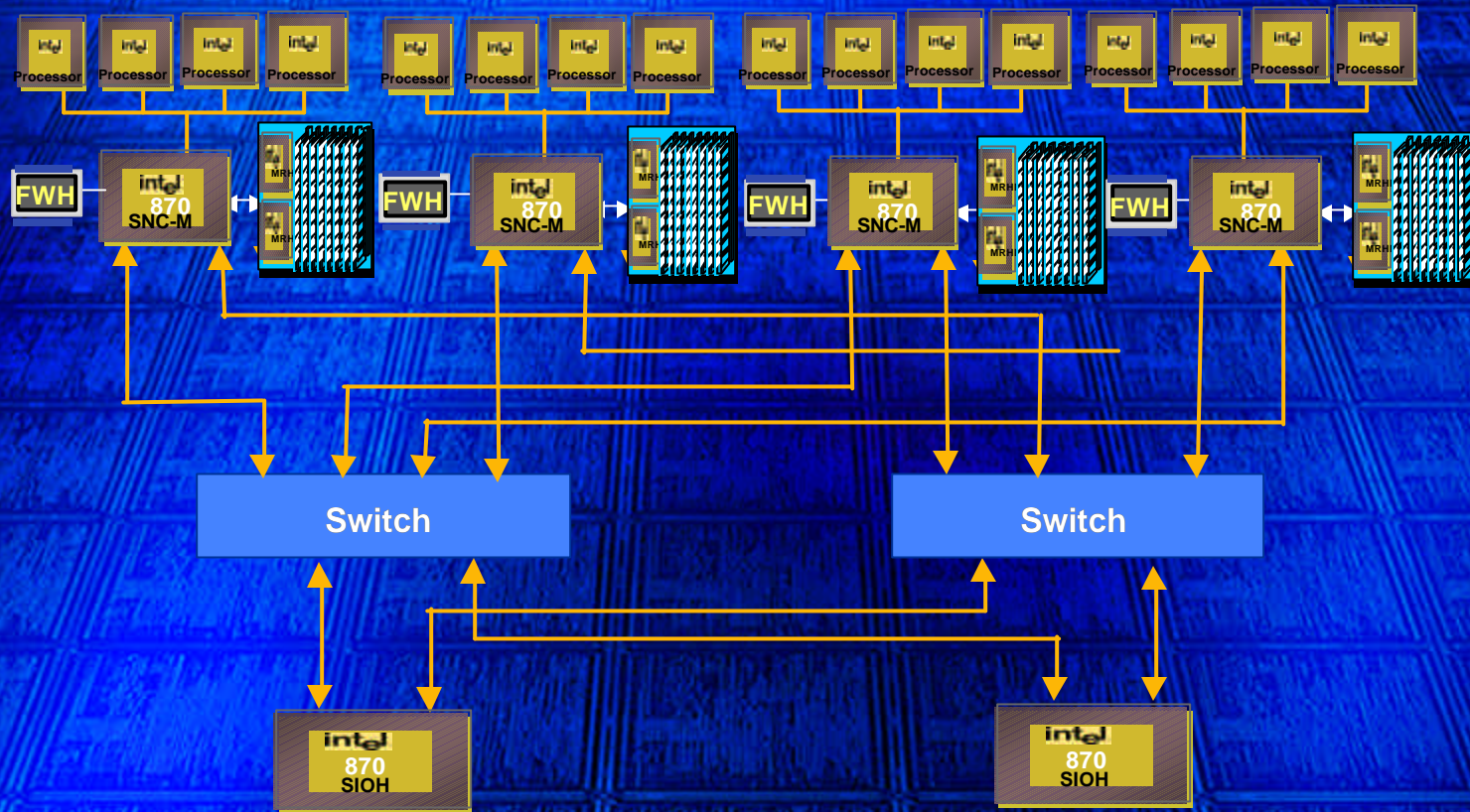


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¹ Source: www.spec.org, HP Server rx4610 on 800 MHz Itanium Processor Using HP-UX 11.20 OS, 4M cache, 440GX chipset, 8GB memory

² Source: Intel Estimates on 1GHz McKinley using HP-UX OS, 3M cache, 870 chipset

Scalable Building Blocks Intel® 870 chipset – 16 Way Server



Scalable platform enables OEMs to develop 64 CPU systems

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RAS & Longevity with McKinley and Intel® 870 chipset...

Processor:

- Supports McKinley, Madison, & Deerfield, allows stable solutions through 2004
- Scales to support up to 64 processors

System Bus:

- Address / Data parity/ECC
- Protocol Errors

Scalability Ports:

- Link-Level Retry Status
- Flit Parity
- Data ECC

All components:

- Data ECC on Configuration Register Writes

Memory:

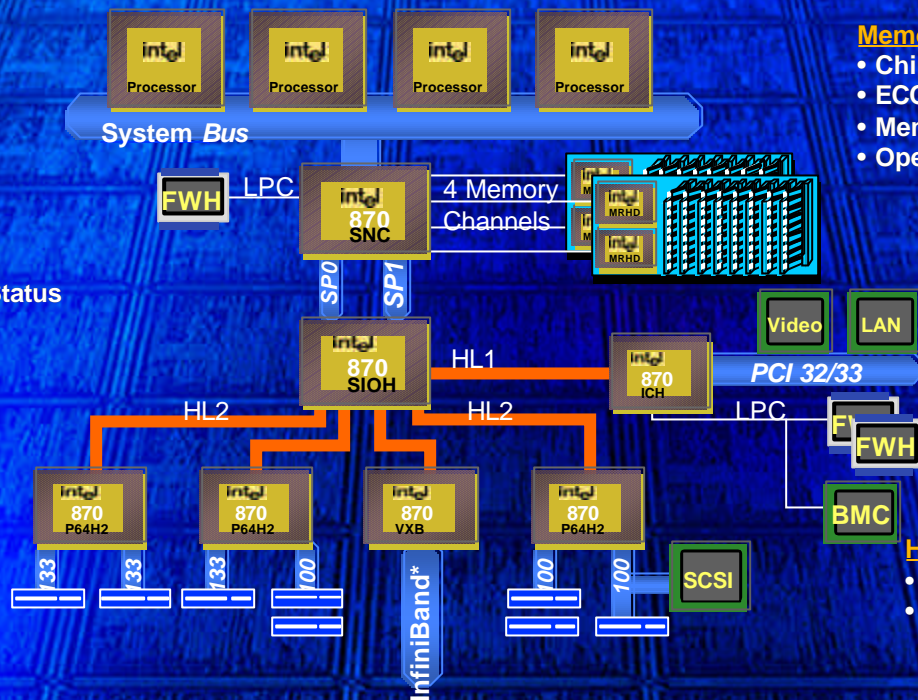
- Chip Kill
- ECC
- Memory Scrubbing
- Operational Errors

PCI-X and Hub Interface 1.0

- Parity on header/data
- Error Response

Hub Interface 2.0:

- ECC on Header/Data
- Error Response



McKinley enables a high level of RAS

Summary

- ✍ Itanium™ and Pentium® III Xeon™ processors provide leading performance today
 - McKinley and the Intel® Xeon™ Processor MP will extend this leadership
- ✍ Hyper-Threading Technology and the Intel® NetBurst™ micro-architecture improve Xeon processor based platform performance
- ✍ Delivering platform technology for world class scalability & RAS

